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ABSTRACT

Using construed data, it is demonstrated that the commonly-used method of showing mean salary by sex or mean salary by rank by sex can be misleading, and that a more realistic picture can be obtained using multiple regression analysis. Faculty staffing patterns were designed for two simulated institutions and is presented showing means and standard deviations of salaries by school, rank, and sex and showing significance of the unique contribution of the sex variable to the regression of salary on rank and years-in-rank variables for the two schools. (SPG)

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EVALUATION OF SEX-RELATED SALARY DISCRIMINATION

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Evaluation of Sex-Related Salary Discrimination

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With virtually every institution of higher education receiving some form of aid from the federal government (and thus subject to Affirmative Action requirements), the ability to identify any sex-related salary discrimination has become increasingly important. However, the very compliance with Affirmative Action guidelines in the employment and promotion of women may tend to increase the apparent relationship of sex to salary level, because faculty salaries are heavily determined by variables (such as rank and years-in-rank) which are often confounded with sex, especially where women are receiving a "catch-up" share of new appointments and promotions.

Probably the most common method of displaying salary data is by computing the mean (or, occasionally, the median) of all salaries within a given category. Often this is supplemented by some measure of variability, if no more than listing the highest and lowest values found in the category. This method is appropriate when the sample is large relative to the number of relevant category combinations or "cells" and when each "cell" is populated by an adequate sub-sample. However, as the number of relevant variables (and categories within variables) expands, the number of cells expands geometrically. Consider a school with a faculty of 300, which has 10 departments, faculty of 2 sexes, 3 different ranks, and 3 different levels of earned degree (we will say nothing about full-time vs. part-time, time-in-rank, research productivity, or any of the other considerations thought to be related to salary). This school would have to sort its 300 faculty into 10 x 2 x 3 x 3 = 180 discrete combinations of just these 4 variables! Clearly, this is not practical. We typically see figures for mean salary by rank, or by rank by sex. The purpose of the present paper is to demonstrate how such means can be misleading, and how the true state of affairs can be more nearly approximated by the use of multiple linear regression.

METHOD

Faculty staffing patterns were designed for two simulated institutions, "School A" and "School B" as shown in Table 1.

INSERT TABLE 1

The variables in Table 1 were coded as follows for each simulated faculty member:

Variable	Name	Coding
Rank level 1	RANK1	1 if in this rank, otherwise 0
Rank level 2	RANK2	1 if in this rank, otherwise 0
Rank level 3	RANK3	1 if in this rank, otherwise 0
Years in rank 1	TIME1	Number of years if currently in this rank, otherwise 0
Years in rank 2	TIME2	Number of years if currently in this rank, otherwise 0
Years in rank 3	TIME3	Number of years if currently in this rank, otherwise 0
Sex	SEX	1 if male, otherwise 0

and salaries were computed using the formula below:

School A: Salary = 10,000 + 2000(RANK2) + 6000(RANK3)
+ 300(TIME1) + 500(TIME2) + 750(TIME3)

School B: Use same formula but add + 500(SEX)

Since salaries are not usually completely determined by two or three variables, a random error was added to each salary by randomly selecting (from a table of random z-scores) a z-score and multiplying it by 1000. Since z-scores can be either positive or negative, addition of this random error could either increase or decrease a given salary. This random error serves as a proxy for all the other unmeasured variables that help determine salary. For School A the random error had a mean of -4.58 and a standard deviation of 984.93. For School B, the mean and standard deviation were 144.56 and 1065.78 respectively. Neither mean differed significantly from zero (the expected mean of this variable).

"Salaries" generated by the specifications above were recorded and means and standard deviations were computed by school, sex, and rank level. Separately by school, salary was regressed on the variables used in computing salary (except for random error). Separate regressions were computed for each school, both with and without the sex variable. The difference in R^2 produced by adding the sex variable was tested for significance.

RESULTS

Table 2 shows the mean and standard deviation of salaries by

INSERT TABLE 2

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school, sex and rank. Within schools, there appears to be a difference due to sex in School A, although we saw that School A was actually free of sex-related bias. We also note that School B appears to be free or nearly free of bias, although there was a systematic bias in the computation of the salaries. Clearly, the data in Table 2 could be misleading.

The regression data, however, as shown in Table 3, successfully

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INSERT TABLE 3

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detect the true state of affairs. School A is found to be free of bias ($F_{(1,113)} = .404$, $P > .10$) and School B's bias is duly noted ($F_{(1,113)} = 10.674$, $P < .005$).

DISCUSSION

The data in Table 2 for School A might well be typical of real institutions that have dedicated themselves to Affirmative Action goals by a hiring policy that seeks to increase the proportion of female faculty. Since most newly hired faculty come in at entry level, the very fact of meeting these goals may increase the <u>apparent</u> discrimination in salary. Similarly, the data in Table 2 for School B may be typical of schools which have resisted the promotion of women to higher ranks, and thereby created an apparent absence of bias when measured by mean salary levels.

SUMMARY AND CONCLUSIONS

Using constructed data, it has been demonstrated that the commonly used method of showing mean salary by sex or mean salary by rank by sex may be misleading; however, a more realistic picture can be obtained using multiple regression analysis.

TABLE 1

Faculty Staffing Design for

Schools A and B: Constructed Data

SCHOOL A

YEARS IN RANK	RANK LEVEL					
	1		2		3	
	M	F	M	F	M	F
0	0	4	1	3	2	2
1	1	3	2	2	3	1
2	2	2	3	1	4	0
3	3	1	4	0	4	0
4	4	0	4	0	4	0

SCHOOL B

YEARS IN RANK	RANK LEVEL					
	1		2		3	
	M	F	M	F	M	F
0	6	0	6	0	6	0
1	6	0	6	0	6	0
2	6	0	6	3	6	3
3	6	3	6	6	6	6
4	6	6	6	3	6	0

TABLE 2

Means and Standard Deviations of Salaries

by School, Rank and Sex

		Rank			
		Level 1	Level 2	Level 3	All Levels
School A:	Male	10,833 (838)	13,353 (1,232)	17,836 (1,275)	14,597 (3,126)
	Female	10,152 (869)	12,136 (1,052)	16,296 (1,199)	11,749 (2,386)
	Both	10,493 (910)	12,988 (1,297)	17,605 (1,368)	13,695 (3,192)
School B:	Male	11,269 (1,121)	13,813 (1,201)	18,195 (1,375)	14,426 (3,135)
	Female	10,965 (1,170)	13,016 (1,167)	18,450 (1,437)	14,031 (3,270)
	Both	11,199 (1,125)	13,585 (1,232)	18,253 (1,375)	14,327 (3,160)

Note. Standard deviations in parentheses

TABLE 3

Significance of the Unique Contribution of the Sex Variable to the Regression of Salary on Rank and Years-in-Rank Variables for Schools A and B

	SCHOOL A	SCHOOL B
Proportion of variance "explained" without sex as variable	R^2 = .91023	R^2 = .87915
Proportion of variance "explained" by adding sex as variable	R^2 = .91055	R^2 = .88958
Unique variance added by sex	.00032	.01043
F for difference between the R^2 values: Degrees of freedom = 1 and 113	.404	10.674
Probability that this difference or a larger difference would occur by chance	P > .10 (Not Significant)	P < .005